



#446

VIKING LANDER 1 & 2
RANGE AND DOPPLER DATA

75-075C-11B

75-083C-11B



VIKING 1 LANDER

RANGE + DOPPLER DATA

75-075C-11B

This data set has been restored. Originally there was one 7-track, 800 BPI tape, written in Binary. There is one restored tape. The original tape was created on an IBM 1108 computer and was restored on an IBM 9021 computer. The DR tape is a 3480 cartridge and the DS tape is 9-track, 6250 BPI. The DR and DS number along with their corresponding D number and time span is as follows:

DR#	DS#	DD#	FILES	TIME SPAN
DR-005494	DS-005494	DD-033813	1	07/20/76 - 01/28/77

VIKING 2 LANDER
RANGE + DOPPLER DATA
75-083C-11B

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY IT CONTAINED ONE 7-TRACK, 800 BPI TAPE WRITTEN IN BINARY. THERE IS ONE RESTORED TAPE. THE DR TAPE IS A 3480 CARTRIDGE AND THE DS TAPE IS 9-TRACK, 6250 BPI. THE ORIGINAL TAPE WAS CREATED ON AN UNIVAC 1108 COMPUTER AND WAS RESTORED ON AN IBM 9021 COMPUTER. THE DR AND DS NUMBER ALONG WITH THE CORRESPONDING D NUMBER AND TIME SPAN IS AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN
DR005506	DS005506	D033814	1	09/05/76 - 01/29/77

REQ. AGENT
VJP

RAND NO.
RC9153

ACQ. AGENT
RWP

VIKING LANDER 1 + 2

RANGE AND DOPPLER DATA

75-075C-11B

75-083C-11B

This data set catalog consists of 1 Viking 1 and 1 Viking 2 data tapes. The tapes are 7 track, 800 BPI, Binary, with 1 file of data each. The tapes were created on a UNIVAC 1108 computer. Time spans are not found on the tapes, but were given to us by the experimenter.

Time spans are as follows:

Viking Lander 1

<u>D#</u>	<u>C#</u>	<u>TIME SPAN</u>
D-33813	C-20571	6/20/76 - 1/28/77

Viking Lander 2

D-33814	C-20586	9/05/76 - 1/29/77
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Langley Research Center

Hampton, Virginia
23665

Reply to Attn of: 401B/Mayo

JAN 13 1978

TO: Goddard Space Flight Center
Attn: 601/Dr. Robert W. Vostreys

FROM: Aero-Space Technologist, Atmospheric Sciences Br., AESD

SUBJECT: The Viking Radio Science Metric Tracking Data Records for
Landers I and II

In accordance with Dr. William Michael's letter to you dated December 1, 1977, the Viking Radio Science Metric Tracking Data Records for Landers I and II during the period from July 20, 1976, to January 29, 1977, are shipped under separate cover. These data records consist of two magnetic tape data files, two sets of IBM cards listing the range hardware delay calibration data, and the data formats.

The Viking Lander I (S/C 26) data tape file (labeled PD 1040) contains 187 sols (Martian days) of range and Doppler data. The Viking Lander II (S/C 29) tape (PD 0042) contains 144 sols of range and Doppler data. These tapes were generated by the Jet Propulsion Laboratory in UNIVAC 1108 format.

The two sets of IBM cards, one set for each Lander, contain the ranging delay calibrations for the time span of the data tape files. The calibrations are given for the combined effect of the signal delays due to both the tracking station's equipment and the spacecraft transponder. The sources of the calibrations are JPL Interoffice Memo 3395-77-051 dated March 10, 1977, and Interoffice Memo 3395-77-052 dated March 11, 1977, by Miles Sue to Joe Brenkle. In the published results of the Radio Science Team analyses, charged particle calibration adjustments were not made to the Doppler data and, thus, no Doppler calibrations are included.

The Lander range calibrations for the effects of charged particles along the signal path are obtained by interpolating the Viking Orbiter range charged particle calibrations at the Lander ranging times. The Orbiter charged particle calibrations are determined using its dual frequency S-X ranging data.

The results of analyses of the data on the tapes are presented in the Radio Science section of the Special Viking Edition of the Journal of Geophysical Research, Vol. 82, No. 28, September 30, 1977, pages 4293-4340. Additional information on the tracking system, data types, range calibrations, and spacecraft transponder is contained in the references of these Radio Science articles. Reprints of the articles are not yet available.

After copying, please return the magnetic tapes to me.

Alton P. Mayo

Alton P. Mayo
2537

6 Enclosures (under separate cover):
2 Tapes
2 Card Decks
Tape Format
Card Format

APPENDIX C

OD FILE FORMAT

GROUP RECORD WORD TYPE CONTENT

C.1 FILE IDENTIFICATION GROUP

C.1.1 Header Record

<u>WORD</u>	<u>TYPE</u>	<u>CONTENTS</u>
1	I	11 Size (in SP words) of each logical record in para C.1.2.
2	I	4 Identifies content of para. C.1.2 records as Fieldata.
3	I	1 Indicates group does not end with a trailer record.
4	I	101 File ID group indicator.
5	I	0 Not used.

C.1.2 One Record Which Identifies The File

1	I	10 The number of integral words in the record.
2-4	Fieldata	"SPACECRAFT ID=xx " where xx is the spacecraft number input by the user in the OD-FILE statement.
5-9	Fieldata	"Y, M, D, H, M=xx, xx, xx, xx, 1108" where the x's represent the time the file was written.
10-11	Fieldata	" ODE=xxxxxx" where x denotes the version of ODE that created the file.

C.2 USER LABEL GROUP

C.2.1 Header Record

1	I	15 Size (in SP words) of each logical record in para. C.2.2.
2	I	4 Identifies content of para. C.2.2 records as Fieldata.

3	I	0	Indicates group ends with a trailer.
4	I	103	Label group indicator
5	I	0	Not used

C.2.2 Zero or More Records of Fielddata Descriptive Text

These would be input to the ODE by the user via the OD-FILE statement. The text would include any comments the user would have concerning the circumstances under which the file was created.

1	I	14	The number of integral words in the record.
2-15	Fielddata	84	Fielddata characters taken from the LABEL parameter of the OD-FILE statement.

3. Group Trailer

1	I	1	
2	Fielddata	Six BCD zeros	

C.3 ORBIT DATA SUMMARY GROUP

C.3.1 Header Record

1	I	9	Size (in SP words) of each logical record in para. C.3.2.
2	I	2	Identifies content of para. C.3.2 records as DFPF.
3	I	0	Indicates group ends with a trailer.
4	I	105	Orbit data summary group indicator.
5	I	0	Not used.

C.3.2 A Record For Each Data-Type That Exists For Each Station

1	I	4	Number of DFPF words in the record
2	DFPF	1.0000000bc00eeffD+16	

where
 $b \leq 1 = \text{S-band}, 2 = \text{X-band}, 3 = \text{L-band},$
 $4 = \text{LS-band}$

c = tracking network indicator (see Orbit Data Group)

ee = receiving station number

ff = data-type indicator (see Orbit Data Group)

3	DPFP	Number of points	
4	DPFP	Time of earliest point	Seconds after January 1, 1950
5	DPFP	Time of latest point	0:0:0.0

C.3.3 Group Trailer

1	I	1	
2	DPFP	0.0D+0	

C.4 ORBIT DATA IDENTIFIER GROUP

C.4.1 Header Record

1	I	6	Size (in SP words) of each logical record in para. C.4.2.
2	I	4	Identifies content of para. C.4.2 records as BCD.
3	I	1	Indicates group does not end with a trailer record.
4	I	107	Orbit data identifier group indicator.
5	I	0	Not used.

C.4.2 One Record Which Identifies The Various Fields and Their Positions Within the Orbit Data Record

1	I	5	Number of integral words in the record.
2-6	BCD		(TIMTAG, IDWORD, OBSVBL, FREQCY, PASSID).

C.5 ORBIT DATA GROUP

C.5.1 Header Record

1	I	241	Size (in SP words) of largest logical record in para. C.5.2.
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2	I	2	Identifies content of para. C.5.2 records as DFPF.
3	I	0	Indicates group ends with a trailer.
4	I	109	Orbit data group indicator.
5	I	0	Not used.

C.5.2 A Series of Records (possibly void):

1	I	M	The number of double precision words of data in the record. $M = 120$ except possibly for the last record in which $M = R*5$ where R is the number of logical records within the record.
2 to 2M+1	I	M/5 logical records	

A logical record is as defined below.

Orbit Data Logical Record

<u>Words</u>	<u>Mode</u>	<u>Contents</u>
1, 2	DFPF	Time of observation; seconds after January 1, 1950 0:0:0.0
3, 4	DFPF	1.aaaaaaabcddeeffD+16 where aaaaaaa = doppler compression time in hundredths of seconds for doppler data = 0 for DRVID = ranging components for range data = 0 for angle data

<u>Words</u>	<u>Mode</u>	<u>Contents</u>
		b = radio band indicator. 0 or 1 = S, 2 = X, 3 = L, 4 = LS c = tracking network indicator. 1 = DSN, 2 = MSFN, 3 = ETR dd = transmitting station number ee = receiving station number ff = data-type indicator 11 = one-way doppler (F1) 12 = two-way doppler (F2) 13 = three-way doppler (F3) 14 = three-way coherent doppler (F3C) 24 = DTAU 25 = DMU 26 = DPLOP 27 = DPLOP2 28 = DMU2 31 = ETR range (ETR) 32 = MARK 1 range (MARK1) 33 = MARK 1A range (MARK1A) 34 = Tau range (TAU) 35 = Mu range (MU) 36 = PLOP 37 = PLOP2 38 = MU2 51 = azimuth (AZ) 52 = elevation (EL) 53 = hour angle (HA) 54 = declination (DEC) 55 = X30 (X30) 56 = Y30 (Y30) 57 = X85 (X85) 58 = Y85 (Y85)
5, 6	DPFP	One of the following i) doppler observable ii) DRVID observable iii) range observable iv) angle observable
7, 8	DPFP	Reference frequency for doppler, DRVID and range data, 0 for angle data, where reference frequency is defined as the frequency of the i) <u>Transponder</u> if doppler ground mode is one-way

<u>Words</u>	<u>Mode</u>	<u>Contents</u>
		ii) <u>Transmitter</u> if doppler ground mode is two-way, three-way or three-way coherent. Reference frequency is taken at light corrected time of data point.
9, 10	DPFP	1.aaaabD+16 where aaaa = Pass identification b = Split pass identification

The logical data records are ordered in increasing order of time/net/station/data type/band.

C.5.3 Group Trailer

1	I	1
2, 3	D	0

C.6 CONTROL STATEMENT GROUP

C.6.1 Header Record

1	I	15	Size (in SP words) of each logical record in para. C.6.2.
2	I	4	Identifies content of para. C.6.2 records as Fielddata.
3	I	0	Indicates group ends with a trailer.
4	I	111	ODE control statement group indicator.
5	I	0	Not used.

C.6.2 BCD Card/Line Images of All the ODE Control Statements

1	I	14	The number of integral words in a record.
2-15	Fielddata	14 words of card/line image (84 Fielddata characters).	

C.6.3 Group Trailer

1	I	1	
2	Fielddata	Six Fielddata zeros	

C.7 FILE CLOSE GROUP

C.7.1 Header Record

1	I	1
2	I	5
3	I	0
4	I	0
5	I	0

C.7.2 End of File Mark

The entire OD file is written and read with non-formatted (binary) read and write FORTRAN V statements. The data within each record are ordered and typed as specified above; the various file groups are also ordered A, B, C, D, E, F and G.

INPUT TAPE X-398 ON MSS
DATA INPUT 07 NF 1 SR 1 1 10

DUMP OF TAPE X-398

TIME SPAN GIVEN BY
Experimenter

D-33813
Nikung 1
6/20/76 - (128hr)

FILE	RECORD	LENGTH	168BYTES
()	1	1	000000000004
()	2	13	000000000000
()	3	13	000000000000
()	4	13	000000000000
()	5	13	000000000000
()	6	13	000000000000
()	7	13	000000000000
()	8	13	000000000000
()	9	13	000000000000
()	10	13	000000000000
()	11	13	000000000000
()	12	13	000000000000
()	13	13	000000000000
()	14	13	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	2	302506101210
()	2	12	050524111244
()	3	12	106075610505
()	4	12	000000000000
()	5	12	000000000000
()	6	12	000000000000
()	7	12	000000000000
()	8	12	000000000000
()	9	12	000000000000
()	10	12	000000000000
()	11	12	000000000000
()	12	12	000000000000
()	13	12	000000000000
()	14	12	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	3	000000000004
()	2	10	000000000000
()	3	10	000000000000
()	4	10	000000000000
()	5	10	000000000000
()	6	10	000000000000
()	7	10	000000000000
()	8	10	000000000000
()	9	10	000000000000
()	10	10	000000000000
()	11	10	000000000000
()	12	10	000000000000
()	13	10	000000000000
()	14	10	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	4	311110310505
()	2	7	60626626767
()	3	7	000000000000
()	4	7	000000000000
()	5	7	000000000000
()	6	7	000000000000
()	7	7	000000000000
()	8	7	000000000000
()	9	7	000000000000
()	10	7	000000000000
()	11	7	000000000000
()	12	7	000000000000
()	13	7	000000000000
()	14	7	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	5	606060606060
()	2	5	000000000000
()	3	5	000000000000
()	4	5	000000000000
()	5	5	000000000000
()	6	5	000000000000
()	7	5	000000000000
()	8	5	000000000000
()	9	5	000000000000
()	10	5	000000000000
()	11	5	000000000000
()	12	5	000000000000
()	13	5	000000000000
()	14	5	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	6	000000000017
()	2	6	000000000000
()	3	6	000000000000
()	4	6	000000000000
()	5	6	000000000000
()	6	6	000000000000
()	7	6	000000000000
()	8	6	000000000000
()	9	6	000000000000
()	10	6	000000000000
()	11	6	000000000000
()	12	6	000000000000
()	13	6	000000000000
()	14	6	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	7	102712063112
()	2	7	110524230505
()	3	7	050505050505
()	4	7	000000000000
()	5	7	000000000000
()	6	7	000000000000
()	7	7	000000000000
()	8	7	000000000000
()	9	7	000000000000
()	10	7	000000000000
()	11	7	000000000000
()	12	7	000000000000
()	13	7	000000000000
()	14	7	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	8	102712063112
()	2	8	110524230505
()	3	8	050505050505
()	4	8	000000000000
()	5	8	000000000000
()	6	8	000000000000
()	7	8	000000000000
()	8	8	000000000000
()	9	8	000000000000
()	10	8	000000000000
()	11	8	000000000000
()	12	8	000000000000
()	13	8	000000000000
()	14	8	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	9	102712063112
()	2	9	110524230505
()	3	9	050505050505
()	4	9	000000000000
()	5	9	000000000000
()	6	9	000000000000
()	7	9	000000000000
()	8	9	000000000000
()	9	9	000000000000
()	10	9	000000000000
()	11	9	000000000000
()	12	9	000000000000
()	13	9	000000000000
()	14	9	000000000000

FILE	RECORD	LENGTH	168BYTES
()	1	10	102712063112
()	2	10	110524230505
()	3	10	050505050505
()	4	10	000000000000
()	5	10	000000000000
()	6	10	000000000000
()	7	10	000000000000
()	8	10	000000000000
()	9	10	000000000000
()	10	10	000000000000
()	11	10	000000000000
()	12	10	000000000000
()	13	10	000000000000
()	14	10	000000000000

